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$$= \frac{\frac{[1+(1/n)][1+(2/n)] \dots [1+(s/n)]}{1.2.3 \dots s} \cdot \frac{[1+(1/n)][1+(2/n)] \dots [1+(t/n)]}{1.2.3 \dots t}}{\frac{[1+(1/n)][1+(2/n)] \dots [1+(u/n)]}{1.2.3 \dots u} \cdot \frac{[1+(1/n)][1+(2/n)] \dots [1+(v/n)]}{1.2.3 \dots v}} y_{c+n}.$$

$$\text{Let } n=\infty, \text{ then } y_{c+n}=1+\frac{ab}{c+\infty}+\frac{a[a+1]b[b+1]}{1.2[c+\infty][c+\infty+1]}+\dots$$

$$\therefore y_{c+n}=1.$$

$$\therefore y_c = \frac{u! v!}{s! t!} = \frac{[c-1]! [c-a-b-1]!}{[c-a-1]! [c-b-1]!}.$$

$$\text{But } y_c = 1 + \frac{ab}{1.c} + \frac{a[a+1]b[b+1]}{1.2.c[c+1]} + \dots$$

Therefore, etc. [See Forsyth's *Differential Equations*, chapter VI, page 185, for treatment of this series.]

PROBLEMS FOR SOLUTION.

ARITHMETIC.

112. Proposed by G. B. M. ZERR, A.M., Ph.D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Suppose 10% traction stock is 20% better in the market than 5% mining stock; if my income be \$500 from each, how much money have I paid for each, the whole investment bringing 6%?

123. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

If $m=2$ cents be the interest on $M=100$ cents for $p=40$ days, find the yearly rate per cent.

*** Solutions of these problems should be sent to B. F. Finkel not later than January 10.

ALGEBRA.

111. Proposed by ARTEMAS MARTIN, A. M., Ph. D., LL. D., U. S. Coast and Geodetic Survey Office, Washington, D. C.

Solve the equation $x(y+z)=a(x+y+z)$, $y(\frac{x}{x+z})=b(x+y+z)$, $z(x+y)=c(x+y+z)$.

112. Proposed by COOPER D. SCHMITT, A. M., Professor of Mathematics, University of Tennessee, Knoxville, Tenn.

In *Hall and Knight's Higher Algebra*, I find the following:

If $a+b+c=0$, then

$$\frac{a^5+b^5+c^5}{5} = \frac{a^3+b^3+c^3}{3} \cdot \frac{a^2+b^2+c^2}{2}; \quad \frac{a^7+b^7+c^7}{7} = \frac{a^5+b^5+c^5}{5} \cdot \frac{a^2+b^2+c^2}{2};$$

also if $a+b+c+d=0$, then

$$\frac{a^5+b^5+c^5+d^5}{5} = \frac{a^3+b^3+c^3+d^3}{3} \cdot \frac{a^2+b^2+c^2+d^2}{2}.$$

QUERY. Is there a general law governing such expressions? Investigate.

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GEOMETRY.

131. Proposed by J. W. YOUNG, Graduate Student, Ohio State University, Columbus, Ohio.

Prove that $\lambda + \mu\omega + \nu\omega^2$, where λ, μ, ν are integers whose sum is ± 1 , represents the points of a quilt formed by regular hexagons. ω = primitive cube root of unity. [From *Harkness and Morley's Introduction to Theory of Functions*.]

132. Proposed by ELMER SCHUYLER, Reading, Pa.

To draw a circle to cut two given circles orthogonally.

133. Proposed by P. C. CULLEN, Principal of Public Schools, Indianola, Neb.

If the two bisectors, trisectors, quadrisectors, etc., of the base angles of a triangle are mutually equal, show that the triangle is isosceles.

134. Proposed by J. C. GREGG, A. M., Superintendent of Schools, Brazil, Ind.

If $ABCD$ is a quadrilateral circumscribing a circle, show that the line joining the middle points of the diagonals AB, CD passes through the center of the circle.

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CALCULUS.

102. Proposed by G. B. M. ZERR, A. M., Ph.D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

A right cone has its vertex at the focus of a paraboloid of revolution, the axis of the cone perpendicular to the axis of the paraboloid. Find the volume common to both.

103. Proposed by HON. JOSIAH H. DRUMMOND, LL. D., Portland, Me.

A park, in the shape of an ellipse whose diameters are 100 and 50 rods, respectively, is surrounded by a wall: one end of a rope, whose length is the circumference of the ellipse, is fastened (outside of the wall) at one end of the longer diameter and the other end at the other end of the same diameter. Over how much surface will a horse graze, which is fastened to a ring moving freely on the rope?

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